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EXAMINER	
YAMNITZKY, MARIE ROSE	

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Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 10/025,919	Applicant(s) NAITO, KATSUYUKI
	Examiner Marie R. Yamnitzky	Art Unit 1774

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *26 December 2001 and 29 April 2003* .

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-20* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-20* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) *5* .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other:

1. Claim 1 is rejected under 35 U.S.C. 112, first paragraph, because the specification, while being enabling for an organic EL device having a luminescent layer comprising a host molecule and a luminescent dye molecule having the characteristics recited in claim 1 wherein the luminescent dye molecule is selected from compounds represented by the formulae set forth on pages 10-11 and the host molecule is selected from polymers represented by the formulae set forth on page 14, does not reasonably provide enablement for the broad scope of combinations of host and luminescent dye molecules encompassed by present claim 1 wherein the dye molecule is limited only by its ability to receive energy from the host molecule in an excited singlet state and in an excited triplet state, and the host molecule is broadly limited to a π-electron conjugated polymer having a carbon-fluorine bond. The specification does not enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the invention commensurate in scope with these claims.

There are numerous π-electron conjugated polymers that are potentially usable for the host molecule required by present claim 1 and there are numerous luminescent dyes that are potentially usable for the luminescent dye molecule required by present claim 1. However, claim 1 requires a transfer of excitation energy from both a singlet and a triplet excited state of the host to the luminescent dye and thus not all combinations of π-electron conjugated polymers and luminescent dye molecules will meet the limitations of claim 1. It is the examiner's position that the specification provides insufficient guidance to one of ordinary skill in the art to be able to determine, without undue experimentation, the scope of polymers and luminescent dyes that can be used in combination to provide the device of claim 1.

2. Claims 2-20 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

The limitations imposed by the term "type" as recited in claims 2, 11 and 20, and by the term "types" in claim 11, are not clear. It is not clear if there is any difference in scope between "at least one type of luminescent dye molecule" and "at least one luminescent dye molecule". It is not clear if the requirement for multiple types of organic EL devices as set forth in claim 11 requires differences beyond the requirement for different emission colors.

In requiring at least one type of luminescent dye molecule to be selected from the group consisting of a transition metal complex and a linear π-electron conjugated molecule as recited in claims 2 and 11, it is not clear if all luminescent dye molecules present in the polymer luminescent layer must be selected from this Markush group.

The limitations imposed by the phrase "or a carbon atom adjacent to the carbon atom in the π-electron conjugated system", as recited in claims 3 and 12, are not clear. Proper antecedent basis is lacking for "the carbon atom in the π-electron conjugated system" since there are multiple carbon atoms in a π-electron conjugated polymer. It is also not clear if "adjacent" requires a direct bond between the specified carbon atoms.

The limitations imposed by claims 4 and 13 are not clear. Proper antecedent basis is lacking for "the carbon atom in the π-electron conjugated system". The language "the carbon atom...has a conjugated carbon atom" is confusing because it is not clear what the carbon atom

could have in addition to a conjugated carbon atom. It is also not clear if claims 4 and 13 require a fluorine atom to be bonded to a carbon atom in the π-electron conjugated system.

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

4. Claims 2-4, 8-13 and 17-19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Pei (US 6,414,104 B1).

See the whole patent. In particular, see column 1, lines 10-38, c. 6, l. 1-c. 9, l. 64, c. 17, l. 1-30 and c. 17, l. 48-57.

Pei discloses conjugated polymers and teaches that they may be used in the luminescent layer of an organic electroluminescent (EL) device. The moiety represented by the second formula at approximately line 35 of column 8 provides a π-electron conjugated polymer having a carbon-fluorine bond wherein the fluorine atom is bonded to an aromatic carbon atom in a π-electron conjugated system. Other conjugated polymers having a carbon-fluorine bond are suggested by Pei's teaching that R^2 and/or R^3 may be halo (e.g. see c. 4, l. 66-67 and c. 6, l. 28-29), and Pei's teaching that R^4 and/or R^5 may be halo-substituted alkyl or halo-substituted phenyl (e.g. see c. 5, l. 1-6 and c. 9, l. 39-64).

Pei teaches that the conjugated polymer of Pei's formula (I) may be used in combination with a second conjugated polymer. Various of the conjugated polymers taught by Pei at c. 17, l. 7-13 meet the limitations of a linear π-electron conjugated molecule that may be used as the luminescent dye molecule for the device of present claims 2-4 and 8-10 and for the apparatus of present claims 11-13 and 17-19. Although Pei do not disclose a specific example of an EL device in which the luminescent layer comprises a conjugated polymer having a carbon-fluorine bond in combination with a linear π-electron conjugated luminescent dye molecule, this combination of materials in a luminescent layer would have been a *prima facie* obvious combination given Pei's teachings as a whole.

With respect to present claims 8 and 17, it would have been within the level of ordinary skill of a worker in the art at the time of the invention to determine suitable relative amounts of conjugated polymers to be used in combination to provide an EL device as suggested by Pei.

With respect to present claims 9, 10, 18 and 19, it would have been *prima facie* obvious to one of ordinary skill in the art at the time of the invention to include other conventional layers in the layer structure of Pei's EL device based on the benefits known to be provided by those layers.

With respect to the display apparatus of present claim 11 and dependents, Pei does not specifically disclose a display comprising an EL device. However, the use of EL devices in display apparatuses was known in the art at the time of the invention, and the display apparatus structure of pixels arranged in a two-dimensional array and comprising different EL devices providing different emission colors is a typical structure for a display apparatus. It would have

been an obvious modification to one of ordinary skill in the art at the time of the invention to incorporate an EL device as suggested by Pei in a display apparatus in order to utilize the benefits provided by Pei's EL device in a typical display structure.

5. Claims 2-4, 6-13 and 15-19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Pei (US 6,414,104 B1) in view of Baldo et al. in *Nature*, Vol. 395, pp. 151-154.

See the whole patent to Pei. In particular, see column 1, lines 10-38, c. 6, l. 1-c. 9, l. 64, c. 17, l. 1-30 and c. 17, l. 48-57.

Pei discloses conjugated polymers and teaches that they may be used in the luminescent layer of an organic electroluminescent (EL) device. The moiety represented by the second formula at approximately line 35 of column 8 provides a π-electron conjugated polymer having a carbon-fluorine bond wherein the fluorine atom is bonded to an aromatic carbon atom in a π-electron conjugated system. Other conjugated polymers having a carbon-fluorine bond are suggested by Pei's teaching that R^2 and/or R^3 may be halo (e.g. see c. 4, l. 66-67 and c. 6, l. 28-29), and Pei's teaching that R^4 and/or R^5 may be halo-substituted alkyl or halo-substituted phenyl (e.g. see c. 5, l. 1-6 and c. 9, l. 39-64).

Pei teaches that the conjugated polymer of Pei's formula (I) may be used in combination with phosphorescent dyes such as the dye described in the Baldo reference. Baldo et al. disclose an organic EL device in which the luminescent layer comprises PtOEP as a phosphorescent dopant. PtOEP is a transition metal complex that is also a rare earth metal complex and meets the limitations of a luminescent dye molecule as required by the claims. Although Pei does

not disclose a specific example of an EL device in which the luminescent layer comprises a conjugated polymer having a carbon-fluorine bond in combination with a transition metal complex luminescent dye molecule, this combination of materials in a luminescent layer would have been a *prima facie* obvious combination given Pei's teachings as a whole.

With respect to present claims 8 and 17, it would have been within the level of ordinary skill of a worker in the art at the time of the invention to determine suitable relative amounts of conjugated polymer and transition metal complex to be used in combination to provide an EL device as suggested by Pei. Baldo et al. teaches PtOEP concentrations within the range set forth in these claims.

With respect to present claims 9, 10, 18 and 19, it would have been *prima facie* obvious to one of ordinary skill in the art at the time of the invention to include other conventional layers in the layer structure of Pei's EL device based on the benefits known to be provided by those layers. Baldo et al. teach these additional layers.

With respect to the display apparatus of present claim 11 and dependents, neither Pei nor Baldo et al. specifically disclose a display comprising an EL device. However, the use of EL devices in display apparatuses was known in the art at the time of the invention, and the display apparatus structure of pixels arranged in a two-dimensional array and comprising different EL devices providing different emission colors is a typical structure for a display apparatus. It would have been an obvious modification to one of ordinary skill in the art at the time of the invention to incorporate an EL device as suggested by Pei in a display apparatus in order to utilize the benefits provided by Pei's EL device in a typical display structure.

6. Claims 2-8, 11-17 and 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Epstein et al. (5,663,573) in view of Hwang et al. (US 6,495,273 B1).

Epstein et al. disclose an organic electroluminescent (EL) device. Epstein et al. teach that by using a combination of organic light-emitting materials, light-emitting materials having a broad range of properties may be provided. See the whole Epstein patent. In particular, see c. 5, l. 56-c. 6, l. 51. Halogen-substituted conjugated polymers are among the list of light-emitting materials that may be used. Regarding a luminescent dye molecule that is a linear π-electron conjugated molecule as encompassed by the present claims, various conjugated polymers disclosed by Epstein et al. as well as anthracene meet the limitation of this dye molecule. Epstein et al. do not specifically disclose a luminescent dye transition metal/rare earth metal complex but such complexes were known in the art at the time of the invention and Epstein et al. teach that known materials may be used.

Epstein et al. teach that halogen-substituted conjugated polymers may be used in a combination of light-emitting materials and this teaching clearly suggests fluorine-substituted conjugated polymers. Epstein et al. do not disclose any specific examples of a conjugated polymer having a carbon-fluorine bond.

Hwang et al. disclose fluorine-substituted conjugated polymers having a carbon-fluorine bond. Hwang's conjugated polymers comprise a phenylene skeleton and may also comprise a fluorene skeleton. Hwang et al. teach that their light-emitting conjugated polymers have improved electron injection and transport ability compared to similar polymers without fluorine substituents, thereby increasing the probability of forming an exciton and enhancing the light

emission efficiency of an EL device. See the whole Hwang patent. In particular, see c. 3, l. 14-51 and c. 4, l. 10-40.

It would have been obvious to one of ordinary skill in the art at the time of the invention to utilize a fluorinated conjugated polymer such as taught by Hwang et al. to make an EL device comprising a combination of light-emitting materials as taught by Epstein et al. One of ordinary skill in the art would have been motivated to use a conjugated polymer as taught by Hwang et al. as one of the components of a mixture of light-emitting materials suggested by Epstein et al. in order to provide the mixture with the benefits afforded by Hwang's fluorinated polymer.

With respect to present claims 8 and 17, it would have been within the level of ordinary skill of a worker in the art at the time of the invention to determine suitable relative amounts of different light-emitting materials to be used in combination to provide an EL device as suggested by Epstein et al.

With respect to the display apparatus of present claim 11 and dependents, Epstein teaches that red, green and blue light emitting devices are needed for display applications, and that a wide range of color outputs can be provided by combining different light-emitting materials (e.g. see c. 2, l. 3-10 and c. 6, l . 25-31 of the Epstein patent). Hwang's fluorinated polymers emit blue light. The use of EL devices in display apparatuses was known in the art at the time of the invention, and the display apparatus structure of pixels arranged in a two-dimensional array and comprising different EL devices providing different emission colors is a typical structure for a display apparatus. It would have been an obvious modification to one of ordinary skill in the art at the time of the invention to incorporate an EL device in a typical display structure wherein the

EL device is a device as suggested by Epstein in view of Hwang in order to utilize the benefits provided by Epstein's EL device and Hwang's fluorinated polymer.

7. Miscellaneous:

Formula (H8) on page 14 appears to contain an error in showing a vinyl rather than a vinylene group between the two rings. This formula does not provide a main chain in which double and single bonds are arranged alternately.

8. The prior art made of record and not relied upon is considered pertinent to applicants' disclosure.

Mori et al. (5,281,489) is background art regarding the use of combinations of luminescent materials in organic EL devices, the use of functional layers in addition to a luminescent layer, and applications for an EL device. For example, see c. 23, l. 39-c. 25, l. 10 and c. 28, l. 63-c. 30, l. 4.

Leising et al. (6,117,529) disclose fluorinated oligophenylenes for use as light-emitters in EL devices. For example, see c. 3, l. 58-c. 4, l. 22.

Jin et al. (US 6,368,732 B1) disclose fluorinated conjugated polymers for use as light-emitters in EL devices. For example, see c. 5, l. 61-c. 6, l. 35.

Igarashi et al. (US 2002/0024293 A1) disclose transition metal/rare earth metal complexes to be used as phosphorescent compounds in organic EL devices. The complexes may be used in combination with other light-emitting materials. For example, see paragraph [0066].

Pei (US 2002/0193551 A1) also suggests conjugated polymers having a carbon-fluorine bond which may be used in combination with other conjugated polymers or a phosphorescent dye. For example, see [0048]-[0072] and [0134]-[0137].

9. Any inquiry concerning this communication should be directed to Marie R. Yamnitzky at telephone number (703) 308-4413. The examiner works a flexible schedule but can generally be reached at this number from 6:30 a.m. to 4:00 p.m. Monday, Tuesday, Thursday and Friday, and every other Wednesday from 6:30 a.m. to 3:00 p.m.

The current fax number for Art Unit 1774 is (703) 872-9306 for all official faxes. (Unofficial faxes to be sent directly to examiner Yamnitzky can be sent to (703) 872-9041.)

MRY
September 30, 2003

Marie R. Yamnitzky

MARIE YAMNITZKY
PRIMARY EXAMINER
1774